METHODS AND APPARATUS FOR FORMING DIELECTRIC STRUCTURES IN INTEGRATED CIRCUITS

ABSTRACT OF THE DISCLOSURE

In some embodiments, a multi-layer dielectric structure, such as a capacitor dielectric region, is formed by forming a first dielectric layer on a substrate according to a CVD process and forming a second dielectric layer directly on the first dielectric layer according to an ALD process. In further embodiments, a multi-layer dielectric structure is formed by forming a first dielectric layer on a substrate according to an ALD process and forming a second dielectric layer directly on the first dielectric layer according to a CVD process. The CVD-formed layers may comprise one selected from the group consisting of SiO_2, Si_3N_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT). The ALD-formed layers may comprise one selected from the group consisting of SiO_2, Si_3N_3, Al_2O_3, Ta_2O_5, HfO_2, ZrO_2, TiO_2, Y_2O_3, Pr_2O_3, La_2O_3, Nb_2O_5, $SrTiO_3$ (STO), $BaSrTiO_3$ (BST) and $PbZrTiO_3$ (PZT).